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A GUIDE

TO THE

COLLECTION OF MINERALS

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A GUIDE

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NORTH GALLERY.

THE six rooms forming the North Gallery are numbered over the doorways. The first four of these rooms contain sixty large and four small Table Cases in which the Collection of Minerals is displayed, besides two Cases containing the Meteorites. The Wall Cases and a few small Table Cases in these Rooms, and the whole space in Rooms V. and VI. are devoted to Fossils.

DEPARTMENT OF MINERALOGY.

The sixty large Table Cases containing the Minerals are numbered consecutively. Commencing at the east end of the Gallery in Room I. and passing down the south side of the four rooms, the numbers return up the north side, the sixtieth table standing opposite to the first. Corresponding with this order of the numbers on the Table Cases is that of the Minerals arranged in them.

The following sketch will serve to indicate the general features of the arrangement, and, by giving the numbers of the particular Table Cases, through which the principal divisions, sections, &c., are distributed, it will serve as a guide for finding any particular Minerals. The names of the species, as well as of important varieties, will be found within the Table Cases, associated with the Minerals to which they belong.

At the eastern end of Room I., adjoining the wall, are two glazed Cases. In these, the important Collection of Meteorites is displayed. In Case A. are seen the stony varieties, the "Aërolites." Of these there are a large number characterised by the presence of minute stony spherules. They are the "Chondritic" Aërolites: they all contain meteoric iron in fine particles disseminated through them, and the more chondritic varieties are on the left hand side of the Case. Among other kinds of aërolites the carbonaceous stones that fell at Cold Bokkeveldt, Kaba, Grosnja, and Montauban, on the right hand end of this Case, are remarkable. So is the great chondritic aërolite that fell at Parnallee, in Madras, on February 28, 1857; presented to the Museum by Sir Wm. Denison, the Governor of that Presidency. The stone that fell at Busti on December 2, 1852, is also in this Case. It is remarkable for containing crystalline calcium sulphide, associated with Enstatite and Augite.

In Case B. are displayed, on the left extremity of the Case, the Siderolites, while the rest of the space is occupied by the Aëro-siderites. The former are masses of meteoric iron containing stony matter; the

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latter consist of the metallic alloys of iron and nickel with small amounts of other metals, known as "meteoric iron." They also contain mechanical admixtures of compounds of these metals with phosphorus, and also with sulphur. Among the specimens of the former class, is the mass found at Breitenbach in Bohemia, in 1861. It contains Silica crystallised as Asmanite in the orthorhombic system, associated with a ferriferous Enstatite (Bronzite), that is in some cases well crystallised. The crystalline structure of the meteoric iron masses is effectively shown by the etching of their polished surfaces. In this case are seen two small but very interesting iron meteorites, the falls of which were witnessed; the one on Jan. 23, 1870, at Nedagolla, in Vizagapatam, India; the other at Rowton, in Shropshire, on the 20th of April, 1876. On the north side of this room is the vast mass of meteoric iron found at Cranbourne, near Melbourne, in Australia, presented by James Bruce, Esq., and weighing above 3½ tons. At the east end of the gallery is one weighing 1,400lbs., presented by Sir Woodbine Parish, found on the Gran Chaco, South America; and adjoining it is another mass of iron of nearly 5 cwt., from the Desert of Bolson de Mapimi, Mexico, supposed to have fallen in 1837.

The Collection of Minerals is arranged in four principal Divisions. These are—

DIVISION I. The Native Elements. Cases 1, 2, 3, 4 (i.)

DIVISION II. The Compounds of Metals, with elements of the Arsenic Group (the Arsenoid elements, viz. Bismuth, Antimony, and Arsenic); or with elements of the Sulphur Group (the Thionids, viz. Tellurium, Selenium, and Sulphur); or with elements belonging to both groups. Cases 4 (ii.) to 12 inclusive.

DIVISION III. The Compounds of Metals with elements of the Chlorine Group (the Halogen elements—Iodine, Bromine, Chlorine and Fluorine). Cases 13 and 14.

DIVISION IV. Compounds of elements with Oxygen. Cases 15 to 60.

These Divisions are again subdivided into sections and classes, the latter embracing the minerals which fall under the same general chemical denomination; as, for instance, the salts of the same acid or of a group of acids chemically and crystallographically equivalent to each other. Each class is further separated into distinct chemical series, the minerals included in any series being such as are designated by the same or equivalent typical formulæ. Subordinated to this chemical system of classification is the final distribution of the several homotypical species of each *chemical* series, into distinct *crystallographic* series, arranged according to the crystalline system to which they belong; the order of sequence of these systems being—1st, the Cubic System; 2nd, the Dimetric or Pyramidal System; 3rd, the Trimetric or Orthorhombic System; 4th, the Hexagonal or Rhombohedral System; 5th, the Oblique or Clinorhombic System; 6th, the Anorthic System; and finally, Amorphous substances, that either present no crystalline forms, or the forms of which, if they be crystalline, are not determinable. In the following observations the term "group" will be reserved to connect Minerals, whether individual species, series, or classes, which present such a community of physical and other characters as imparts to them a sort of family resemblance.

Division I. The Native Elements.

In Cases 1, 2, 3, and the first half of 4, are arranged such of the elementary forms of matter as are found occurring in nature in the uncombined state. These native elements, which form but a small proportion of those the chemist has eliminated from the Mineral Kingdom, are arranged in sections, of which the first is that of the native metals and their alloys. Div. I. Cases 1, 2, 3, 4 (i.)

Of the series of native metals crystallising in the cubic system the various forms of Copper, Silver, and Gold are the most important; and crystals of these metals are exhibited, remarkable for the perfection of their forms, or conspicuous for their size. The crystallised copper from Siberia and from Lake Superior, the silver in crystals from Kongsberg and from Freiberg, the suite of specimens of gold from Merionethshire and other British localities, two unique nuggets of crystallized gold from the MacIvor Diggings, in Australia, and one from California, are especially worthy of remark. Besides these, will also be seen native foil of silver and of gold: moss-like filamentary aggregations of copper and of silver; nuggets, and washed grains of gold, and specimens of all these metals, in which a simple crystalline form, by being repeated or prolonged along particular axes has built up dendritic, ramose, capillary, and other singular kinds of structure. Among the specimens of gold and of *electrum*, or argentiferous gold rich in silver, from Transylvania, are some worthy of notice from the sharpness of their crystalline forms. Native lead from Sweden, and a crystalline nugget of platinum containing metallic iron and presenting magnetic polarity, given by H. I. H. the Grand Duke of Leuchtenberg, are exhibited in Case 3. The rhombohedral series of metals includes an isomorphous group — the Arsenoids — namely, Arsenic, Antimony, and Bismuth, with which its crystalline form, rather than its chemical analogies, associates the rare native element Tellurium. Cases 1, 2. Case 2. Case 3 (i.)

Next to the metals are arranged the Metalloids, a section including the carbon group and the sulphur group. In the former, elementary Carbon is illustrated in its two allotropic mineral forms: Diamond and Graphite. Of the Diamond, a large and extremely choice series of crystals is exhibited, together with models of the most famous for their size and history of the specimens of this. the hardest and most resplendent of gems. Specimens of the diamonds of South Africa are exhibited with the rock in which they are found. Case 3 (ii.)

Div. I. Case 4. Of Sulphur, large and splendid yellow crystals are exhibited from Conil, near Cadiz, and fine specimens from Sicily. The glazed front of Case 2 contains specimens belonging to this division, of extraordinary size and beauty.

Div. II. Division II. Compounds of the Arsenoid and Thionid Elements.

Cases 4 (ii.) to 10 (i.) Leaving the native elements, we enter upon minerals which are the products of the chemical combination of the elements with each other; but the transition is not an abrupt one. The alloys, or mixtures of metals of one and the same group, were associated in the first division with the metallic elements that compose them. But where metals belonging to distinct chemical groups are combined, they cannot be classed with the free elements. Such are the combinations of Arsenic, Antimony, and Bismuth with metals of other groups, and they (the arsenides, antimonides, &c.) accordingly take their places as the first section of Division II and will be found arranged in the latter half of Case 4.

Next in order to these are placed, as a second section of Division II., the compounds of metals with the "thionid elements;" and accordingly the tellurides, selenides, and sulphides are displayed in Cases 5 to 9 inclusive.

These are succeeded by a third section of this division, namely, by Minerals to form which compounds belonging to each of the former sections are combined together.

These three sections may be severally represented by their prominent members, the arsenides, the sulphides, and the arseno-sulphides.

Section i. Case 4 (ii.) The first of these sections comprises the cuprous arsenides, such as Domeykite, the tricuprous arsenide; also, the antimonide of Silver or Dyscrasite, diargentous antimonide. Besides these there are included in this section several compounds of Iron, Cobalt, and Nickel. Nickeline, called also "Copper-Nickel," from its colour, is a rhombohedral mineral, the nickel arsenide. Chloanthite is the nickel diarsenide and Smaltine, or "tin-white Cobalt," the cobalt diarsenide, of which Safflorite is a variety, containing Iron in place of a part of its Cobalt. These minerals are cubic in crystallisation, but some of the substances which constitute them are also found in orthorhombic forms, affording examples of dimorphism. Thus the nickel diarsenide, when thus occurring in crystals of the orthorhombic system, is the mineral Rammelsbergite (of Dana), and Leucopyrite is a corresponding iron diarsenide.

In this section is also included the cobalt triarsenide, Skutterudite.

Section ii. The second section includes the various compounds of Sulphur. Selenium, or Tellurium—the Thionid elements—with the metals, Silver, a monad element, and Copper, a metal that in one group of its salts plays the part of a monad element, contribute to form a small group in this section of the type $M_2\Sigma$. Eucairite is a selenide of Silver and Copper, and Crookesite is a selenide of Copper and Thallium.

Div. II.
Case 5 (i.)
Case 7 (i.)
Cases 5 (ii.) and 6.

Hessite and Petzite are the tellurides of Gold and Silver, Naumannite the corresponding selenide of Silver, while Argentite is the sulphide of Silver. The latter are cubic in crystallisation, but the silver sulphide is a dimorphous mineral presenting itself as Acanthite in forms belonging to the orthorhombic system. To this system belongs also Copper-glance, a valuable ore of Copper, the "cuprous" sulphide. Among the other important minerals in this section, a cubic series of mono-sulphides occurs which includes two commercially very important ores—Galena, the sulphide of lead, and Blende, the sulphide of zinc.

Cases 7 & 8.

A Rhombohedral series includes Covelline, the cupric sulphide, Cinnabar, or mercuric sulphide, the unique ore of the important metal Mercury. Millerite is the nickel monosulphide, and Greenockite, a rare mineral in bright yellow crystals, consists of the corresponding cadmium sulphide.

Case 8.

There is also an important series of disulphides wherein Hauerite and Iron-pyrites, which are respectively the persulphide of manganese and of iron, are cubic, while as Marcasite the latter compound is orthorhombic in crystallisation. These two forms of iron persulphide are frequent and familiar minerals, Iron-pyrites being conspicuous for its sharply defined forms, and Marcasite, or "White Iron-pyrites," for the fantastic groupings in its crystallisation that have obtained for it the various names of Spear pyrites, Cocks-comb pyrites, &c.

Case 9.

Molybdenite ($Mo\ S_2$) and Realgar ($As_2\ S_2$) are severally molybdenum and arsenic disulphides; the former a rhombohedral, the latter an oblique mineral.

Here also is included Laurite, the rare ruthenium sulphide.

Case 9.

Among the trisulphides we find some important compounds of the triad elements crystallising in the orthorhombic system. They are Orpiment, or arsenic trisulphide ($As_2\ S_3$), and the two isomorphous trisulphides of Bismuth and Antimony, Bismuthite ($Bi_2\ S_3$) and Antimonite ($Sb_2\ S_3$). Of both the last minerals, and in particular of Antimonite, very fine specimens are in this Table Case. Antimonite is an important source of the metal Antimony.

Sect. iii.
Case 10.

The third section of the division is composed of minerals wherein certain arsenides, &c., of Section i. are combined with sulphides of Section ii., or which may be looked on as the result of a replacement of half the Arsenic of the minerals in the former section by its equivalent of Sulphur. Of these there is a cubic series, including Cobaltine, or Cobalt-glance, the "Silver White Cobalt" of early mineralogists, a Cobalt Sulphide with part of the Sulphur replaced by Arsenic and part of the Cobalt by Iron $\left\{ (Co, Fe)\ (S.\ As)_2 \right\}$. In Gersdorfite or Arsenical Nickel-glance, half the Sulphur is replaced by Arsenic, and in Ullmannite or Antimonial Nickel-glance by Antimony and Arsenic.

Case 10.

In this section, also, the minerals of this chemical type exhibit a dimorphism similar to that of Pyrites and Marcasite among the disulphides of Section ii., and of Rammelsbergite and Chloanthite among the diarsenides of Section i.; for in Mispickel and Glaucodote we

Div. II. find arsenio-sulphides of Iron and of Cobalt with Iron of the same
chemical type as Cobalt-glance, but crystallised in the orthorhombic
system. Thus the three homotypic series of cubic diarsenides, disulphides,
and diarseniosulphides belonging to the three sections
of this division might be treated as a single group, while the three
corresponding trimetric series may be looked on as another such group.

Sect. iv. Besides the three sections already described, this division contains
a fourth, wherein metallic sulphides are so combined with sulphides
Cases 10, of Arsenic, Tin, Iron, &c., as to produce a series of sulphur salts,
11, 12. in the constitution of which Sulphur plays the part which Oxygen
plays in the ordinary oxygen-salts. This section is a numerous one
in point of species, and the following are a few minerals included in
it that are especially worthy of note.

In one (and that a somewhat ambiguous) class of these Salts, Iron,
either as an iron sesquisulphide ($Fe_2 S_3$) or an iron persulphide
($Fe S_2$), would seem to enter as a constituent of the "acid" ingredient.
Case 10. In this class we meet with two important copper ores, the largely worked
Chalco-pyrites or Copper-pyrites, and Erubescite or Purple Copper-ore.
Of both these minerals, there are crystallised specimens from Cornwall;
and massive pieces from Tuscany are seen in the front of Case 7.

The rare mineral, Sternbergite, consisting of Iron, Sulphur, and
Silver, belongs also to this class; while Linnæite, or "Cobalt-pyrites,"
($Co_2 S_3$, CoS,) is a sulphur-compound of Cobalt, exactly analogous to
the oxygen-compounds termed the "magnetic oxides" of Iron or
Manganese.

Case 11. Tin-pyrites is a dibasic cuprous sulphostannate, containing Iron and
Zinc.

The largest class of the sulphur salts is that consisting of sulpharsenites,
sulpho-bismuthites, and sulph-antimonites. Among these
Case 11. Tetrahedrite (Fahlerz or Grey Copper ore) is noticeable as a most
important ore of Copper. It is a tetra-basic sulph-antimonite of that
metal, in which the copper is frequently replaced by small quantities
of silver, and is also associated with sulphides of Iron and Zinc. In
some of its varieties, as in Tennantite, the Antimony trisulphide
is entirely, and in others partially, replaced by an equivalent of Arsenic
trisulphide. The argentiferous Tetrahedrite is a valuable ore of
Silver. Remarkable specimens of Bournonite, a tri-basic sulph-antimonite
of Copper and Lead from the Herod's-foot mine in Cornwall,
Case 11. are here in juxtaposition with those from the Hartz, and from Traversella.
The so-called Red Silvers, a group of isomorphous rhombohedral
minerals, are the tri-basic sulphantimonite and sulpharsenite of Silver,
Case 12. Pyrargyrite and Proustite; sometimes in a comparatively isolated
state, but more frequently blended together in various proportions.
Beautiful as well for their forms as for their blood-red colours, that
are deeper in tint according as the antimony preponderates over
arsenic, they constitute one of the more precious of the ores of Silver.
The specimens of Pyrargyrite and Proustite exhibited in Case 12, and
in particular those of the latter mineral from Chili, are extremely
fine.

Div. II. Case 12.

Among these a large mass of resplendent crystals, of a rich ruby colour by transmitted light, was presented by H. Ludlam, Esq., and is a unique specimen.

Among the rarer minerals, attention may be called to the fine specimens of a variety of Freieslebenite, from Hiendelencina, in Spain; also to Fireblende and Xanthocone, the latter containing a tri-basic sulpharsenate and sulpharsenite of Silver; and to the series of minerals from the Binnenthal, including very fine crystals of Jordanite.

Division III. Compounds of the Halogen Elements.

Div. III. Sect. i. Cases 13, 14.

This next principal division of the Collection is also subdivided into the simpler compounds, and a more complex section of Salts. Among the former will rank Calomel, Salammoniac, Common Salt (Sodium chloride), and Sylvine, the corresponding potassium chloride, the two latter being crystallised in large cubes and cubo-octahedra. With these are arranged the chloride, iodide and bromide of Silver, and the mixtures of these *inter se* which are kept secluded from the light. The crystal forms and colour suite of Fluor spar exhibited in Case 14 form a series as remarkable for beauty as any in the Collection.

Case 13.

Sect. ii. Case 14.

The Salts in this division are represented by certain double fluorides, of which the most important is the Greenland mineral Cryolite (sodium aluminium fluoride), represented by some excellent specimens in its crystallised form.

Division IV. Compounds of Oxygen.

Div. IV. Cases 15, to 60.

The remaining division consists of Minerals of which *Oxygen is a constituent ingredient,* a class necessarily large on a planet with an atmosphere consisting in considerable proportion of this chemically energetic element. The rocks which constitute the earth's crust are aggregates of minerals falling under this chemical division. Here, as in the previous divisions, we distinguish the more simple kinds of combination from the more complex; and though such a distinction as is expressed by a section of oxides and a section of salts is a difficult one to define with logical precision, it yet serves the object sought in a system of classification, by bringing together compounds that most closely resemble each other, the different classes falling into a natural sequence, nearly in the order of the simplicity of their chemical formulæ.

Section i.

The first section of this chemical division, the Oxides, will be found arranged in Cases 15 to 26, those containing the greater proportion of oxygen following after those that contain fewer. Commencing with basic types of oxides, we pass through certain comparatively neutral oxides (among which we must look for those members of the section which possess the most equivocal claim to a place in this section); and we then come to the higher oxides which act the part of acids in combining with bases.

The oxides include several very important minerals. First in order

Div. IV. Case 15. among them is Cuprite, the red oxide of Copper, cuprous oxide. It occurs in ruby-coloured and transparent crystals of the cubic system. These are seen in the first half of Case 15, and with them are the "Tile ore," from the Urals, and the bright-red capillary deposits of Chalcotrichite. The cupric oxide, as Melaconite and Tenorite, succeeds to the crystalline oxides of Magnesium (Periclase), and of Zinc (red oxide of Zinc, or Zincite), in the other half of this Case. These are followed, first by the hydrated monoxides, including Brucite, the magnesium hydrate, which presents delicate hexagonal transparent crystals; in succession to which are minerals in which oxides of this type are associated with compounds belonging to preceding Divisions of the Collection. The lead-oxychlorides, Matlockite and Mendipite, are arranged here with Atacamite, a cupric chlorhydrate, and of Percylite, a beautiful mineral, of which one specimen, of uncertain locality, is associated with Gold. It is a hydrated combination of the oxychlorides of Lead and Copper.

The next class in the section of oxides is composed of minerals of a Case 16. (ii.) chemical type, similar to that of the magnetic oxide of Iron (the ferro-ferric oxide), which may in fact be viewed as a combination of ferrous oxide with ferric oxide, and thus, while possessing the formula and a place in the section of the oxides, has claims to be recognised as a salt. For the group of cubic-formed minerals to which Magnetite more especially belongs, the "Spinel Group," includes Franklinite and Chromite (Chromic-iron), which latter mineral is the source of the chrome yellow and of some other colouring matters employed in the Case 16 (i.) arts. The Spinels, properly so called, also belong to it. These are aluminates of Magnesium, of Zinc, Iron, or Manganese; ferric oxide occasionally playing the part of alumina. The deep-red "Spinel Ruby" and the pale rose-tinted "Balas Ruby" are beautiful gems cut from specimens of this Mineral, of which a good assortment of crystals is exhibited. Pleonast, Gahnite, Dysluite, are opaque varieties of Spinel. To this class also may be referred the Chrysoberyl, a combination of glucina and alumina (glucinum aluminate), belonging to the same type. It is orthorhombic in crystallisation, and as a gem, Case 16. (ii.) known by the name of "oriental chrysolite," it presents itself as a beautiful greenish-yellow stone, equal in lustre and almost in hardness to the Sapphire. The variety Cymophane is so named from a cloudy appearance that presents itself in two of the faces of the crystal, and is retained even when the transparent stone is cut and polished. Cut *en cabochon*, *i.e.*, with a concavo-convex, or with a convex form, the less transparent specimens furnish one of the kinds of stone to which the jewellers give the name of Cat's-eye. Of the dark green variety from the emerald mines of the Ural, termed Alexandrite, very fine specimens are seen in this Case. It is amethyst-Case 17. coloured by artificial light.

The next class among the oxides is that of the sesquioxides. The pure oxide of Aluminium is seen in colourless crystals of Corundum, consisting for the most part of hexagonal pyramids and prisms. With minute traces of colouring ingredients, these

Div. IV.

crystals assume rich hues, and when transparent become gems conspicuous for their extensive colour-suite, that rank next in value, as in lustre and hardness, to the diamond. These are the colourless Lux Sapphire, the (azure) Sapphire, the Ruby, the 'Oriental-Topaz,' 'Oriental-Amethyst,' 'Oriental-Emerald,' &c.; gems not to be confounded with those from which they borrow their names, while distinguished from these by their title "Oriental," in allusion to the Eastern lands, India, Ceylon, Siam, Pegu, &c., which from the earliest times have produced the gem forms of this mineral in their greatest perfection. In the "Star stones" a six-rayed star is seen, of which the position is symmetrical in respect to the morphological axis of the crystal; and through the less pure varieties of Corundum, we descend to the opaque and granular, massive, but still, from their hardness, valuable states of this Mineral, of which Emery is an impure form. Identical in chemical and crystallographic type with Corundum, though very different in aspect both in its crystalline and massive varieties, is the valuable iron ore, Hæmatite, the ferric oxide. A tarnish on some of its crystals, especially on those from Elba, produces an iridescent effect of great beauty. With Hæmatite is placed Ilmenite, or Titanic-iron, one of the ambiguous species of this class. Intimately blended with the former mineral in all proportions and crystallising in its forms, it yet presents the formula of titanate of Iron, a formula, however, which, as containing two equivalents of metal united to three of oxygen, is in fact homotypic with the sesquioxides.

Cases 17 and 18.

Cases 18 (ii.) and 19.

The hydrates of this class include the important iron ore Limonite (Brown-hæmatite), and Gœthite, which is monohydrated ferric oxide. In juxtaposition with the fine Cornish specimens of this mineral, from the Restormel mine, are Manganite and Diaspore, respectively the monohydrated manganese and aluminium oxides, isomorphous with Gœthite.

Case 20.

The class of dioxides is illustrated by a series of crystals and other forms,—especially rich in the Cornish varieties—of Cassiterite or Tin-stone, *the ore* of tin: and in the same Case is placed the Zircon, consisting of the associated zirconium and silicon dioxides. Its crystals, like those of Cassiterite, with which it is nearly isomorphous, are pyramidal. Its pellucid varieties are gems. The dull green is the Jargoon, while peculiar ("hyacinthine") red tints characterize the gem known as the Hyacinth or Jacynth, of which fine cut specimens are in Case 20 (iv.). The yellow and blue tints are rare, but the more pellucid and colourless zircon, from its exceptionally high refractive power, approaches even the diamond in brilliancy.

Case 21 (i.)

In the same continuous series is Rutile, the titanium dioxide isomorphous with Zircon, and approximately so with Cassiterite. Anatase is the same substance, also in pyramidal forms, but with different parameters; while in yet a third series of forms this trimorphous titanic dioxide is to be seen as the orthorhombic mineral Brookite, of which the specimens from the Snowdon district are remarkable.

In this Case is also exhibited the manganese dioxide (the "peroxide"), Pyrolusite, the mineral employed for the production of

Div. IV. oxygen gas, and for the evolution from the chlorides of their chlorine, so largely employed in the arts.

Cases 21 (ii.) to 25. The Rhombohedral system is represented in the class of the dioxides by Quartz and its varieties.

Cases 21 to 29. This important mineral is silica, the oxide of silicon (silicon being an element of the carbon group). Cases 25 (ii.) and 26 (i.) This oxide occurs in a state physically distinct from Quartz, in the Opal, which is amorphous: specimens of it will be found at the end of the crystalline series of the dioxides. Among the purer varieties of these are the Mexican Fire Opal, and the beautiful and almost exclusively Hungarian gem, the Noble Opal, conspicuous for its fascinating play of colours. Specimens Case 21 (ii.) of Tridymite will be seen in Case 21; it is a crystallised form of silicic acid, with the specific gravity of opal. Its crystalline forms, however, are distinct from those of Quartz, which is the more common and Case 22. more dense variety of Silica. The latter is seen in its purest form as Quartz crystal in Case 21. Its tinted specimens may vie in point of colour with jewels of denser substance and higher refrangibility. Among these are the lilac-hued specimens of the Amethyst, the Brazilian specimens of which, as well as of the yellow kind, show the "rippled" fracture which distinguishes them from the ordinary Quartz, with its smooth conchoidal fracture. They are further distinguished by their optical properties.

Cases 23 to 25. A series of minerals succeeds, formed by mixtures of the crystalline with the opaline silica, and of these with iron oxides and argillaceous and other impurities. They include the various kinds of Jasper and of Chalcedony, Prase, Bloodstone and Heliotrope, Hornstone, Carnelian, Sard, Plasma, while the various banded, ribbed, eyed, spotted, clouded, and other fantastically figured and coloured stones of the Agate kind, including Onyx and Sardonyx, in every gradation of translucency, illustrate the modes in which these mixed minerals occur, and often evidence the successive action of the processes that formed them. Of the pseudomorphism of minerals, a good example is furnished in Case 24 (i.) Haytorite, a mineral composed of a chalcedonic Hornstone, but presenting the forms of Datholite (compare Case 51).

Section ii. We next enter on the section of Oxygen Salts, the first class under Cases 27 to 35. which is occupied by the Carbonates. The isomorphous character of the several salts of the metals Calcium, Barium, Strontium, Lead, and Magnesium, and of the corresponding iron and manganese salts with them, finds illustrations in the long array of the anhydrous carbonates which are here exhibited, crystallised severally in forms which are equivalent or united in various proportions of admixture in the same crystal.

These carbonates are divided by their crystalline forms into two large series or groups. The first comprises those crystallising in forms on the type of Aragonite, the orthorhombic calcium carbonate. Among these are, besides Aragonite, Witherite the barium carbonate, Strontianite the strontium carbonate, and Cerussite the lead carbonate. The specimens of this last mineral and those of Witherite are especially noticeable.

The second series comprises those minerals of this chemical type that crystallise in rhombohedral forms isomorphous with those of Calcite, the rhombohedral calcium carbonate. These include the magnesium carbonate, Magnesite; zinc carbonate, Calamine; and the iron and manganese salts termed Chalybite and Rhodochroisite respectively. They include also the mixtures of these in a very considerable variety, such as Dolomite, Ankerite, Brown Spar, &c. Baryto-calcite crystallises in forms of the clinorhombic system, and establishes the trimorphism of these minerals by exhibiting the barium and calcium carbonates crystallised in a third set of distinct crystalline forms. The crystals of Calcite in Cases 29 to 31, and in the fronts of Cases 27 to 29, form, with one very large crystal in a separate case in Room III., a very fine series, as well for their varied forms as for the conspicuous illustrations certain of them afford of the highly double-refracting property of the crystal. Some singular pseudomorphs from Devon, in the Chalybite Case, are well worthy of notice. Div. IV.

The Limestone and Dolomite rocks are formed of Minerals from this series, in various massive, granular, or crystalline aggregations, the latter of which frequently form Marbles; while into the Clay-ironstone, with which the blast furnaces of Wales and Scotland have been largely fed, spathose-iron, or Chalybite, enters as an ingredient in a high percentage.

Case 34 (ii.) Among the hydrated carbonates, and carbonates combined with hydrates, or with compounds belonging to the previous divisions, attention may be called to the green and blue copper ores, Malachite and Chessylite, of which latter a very fine series of crystals is exhibited.

Case 35 (ii.) Case 35 contains also fine specimens of Phosgenite, a combination of the chloride and carbonate of lead; and of Parisite, an analogous compound from the Emerald Mines of Santa Fè di Bogotà, containing the fluoride combined with the carbonate of calcium and of the rare metals of the cerium group.

The Silicates, occupying no less than fifteen Cases, form the next class in this section. The minerals comprised in this large, varied, and important class are arranged in series distinguished by the type of oxide that characterises the bases in the silicate. Thus the silicates corresponding to monoxide-bases (ferrous oxide, magnesia, &c.) are arrayed in one series; those the bases of which are sesqui-oxides are in another; and such as contain bases of both kinds fall into a third. The respective hydrates are comprised under the series to which the minerals of corresponding anhydrous types belong.

Case 36 (i.) The first of these series is composed of such silicates as are formed by the combination of silica with monoxides only, or in which sesqui-oxides are met with only as accidental or intrusive ingredients. The anhydrous section of this series contains, among others, the following minerals. Phenakite, the di-glucinum silicate, and Willemite, a zinc-silicate corresponding and isomorphous with it, represent a rhombohedral series of dibasic silicates. The specimens of Phenakite from the emerald mines of the Urals are extremely fine. Of the same chemical type are the minerals comprised in the Olivine group, which are orthorhombic in their forms, and include Tephroite, di-manganous